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TITLE: New Seismic Reflection Profiling Across the Northern Newark Basin USA: Data Acquisition and Preliminary Results

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ABSTRACT BODY: Deep saline formations in basins underlying major population centers represent opportunities for carbon (CO₂) sequestration, but intensive surface development in such settings can hinder field operations to acquire geologic and geophysical data critical to effective characterization. Seismic-reflection is a tool that can be used to characterize basins and their potential capacity for carbon storage. The northern part of the Triassic-Jurassic Newark Rift Basin represents a potential storage opportunity for carbon as a result of its proximity to large-scale CO₂ emitters; however, a lack of deep geologic and seismic data from this area has precluded evaluation of this basin to date. As part of the Department of Energy's (DOE) National Energy Technology Labs (NETL) Carbon Sequestration programs portion of the American Recovery and Reinvestment Act (ARRA)- and NYSERDA-funded TriCarb Consortium for Carbon Sequestration basin characterization project, two new seismic-reflection profiles were acquired in the northern portion of the Newark Basin in Rockland County, NY and Bergen County NJ. This densely developed region, proximal to New York City, presents a variety of challenges for seismic surveys, including route selection and access, community acceptance, high traffic volumes and associated data noise, in addition to regulatory requirements and private property limitations. In spite of these challenges, two high-resolution, perpendicular lines were successfully surveyed in late March and early April, 2011; one dip line extending 21 km (13 mi) across most of the basin (east-west), and a shorter strike line extending 8 km (5 mi, north-south). The survey lines intersected near the location of a planned 8,000 ft stratigraphic borehole to be drilled by the TriCarb consortium. Three vibroseis trucks comprised the source array. Source points were spaced at 36.5 m (120-ft) intervals and geophone accelerometers collected data at a 3.05 m (10 ft) intervals.

Seismic-reflection data processing included three main objectives: 1) attenuate high levels of noise related to the high volume traffic, 2) constrain the depth and thickness of the diabase sill at the planned borehole site and 3) optimize the image of potential reservoirs relative to the diabase sill. The high volume traffic noise was successfully removed from the data using several attenuation algorithms. Refraction statics were selected individually to improve reflector coherency over the automated solution and single sensor data were used throughout to maximize frequency bandwidth and reduce smearing related to the offset 2D geometry. In general, these techniques revealed a well-defined basin image that exhibits structural characteristics of an eroded half graben. The diabase sill and potential reservoirs appear to be well-imaged near the planned borehole site. The successful completion of this survey and final product demonstrate that geophysical data acquisition can be achieved in highly developed regions that have carbon storage potential.

KEYWORDS: [0935] EXPLORATION GEOPHYSICS / Seismic methods.

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